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Boerhavia difusa - Plant with Traditional Wisdom and Pharmacological Importance - A Review

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ABSTRACT

In the arid zone of India several plants are found especially after the rainy season. Among them *Boerhavia diffusa* or Bipni is of much importance due to its pharmacological properties. Plants have antioxidant, antibacterial and antidiabetic properties. Its whole plant part is useful and is used by local people based on traditional wisdom. The present study aims to review the medicinal importance of the species including its phytoconstituents and their pharmacological significance. It also focuses on the ecological and medicinal importance of the species.

Keywords: Boerhavia; Arid Zone; Boeravinones; Pharmacological Properties; Anti-Diabetic; Nyctaginaceae; Punarnavoside; Anti-Inflammatory; Punarnava; Analgesic; Punarnavine; Boerhavic Acid.

1.0. Introduction

Boerhavia diffusa belongs to family Nyctaginaceae. Genus *Boerhavia* has 40 species and is distributed in the tropical and subtropical and temperate regions of the world. It is found in Australia, china, Egypt, Pakistan, Sudan, Srilanka, South Africa, USA and in several other countries. Out of these, 6 species are found in India. In India 6 species of Boerhavia are found namely *Boerhavia diffusa, B. chinensis. B. erecta, B. repens, B. rependa and B. rubicunda*. Among them *Boerhavia diffusa* is indigenous to India. It is found in Himalayan region, it grows well on wastelands and in field during rainy season. The plant is also cultivated to some extent in west Bengal.

It is found in warmer parts of India throughout the country upto an attitude of 2000 meter in the Himalayan region. It grows in wastelands and in the field after the rainy season. It is known by different names in different languages. In Sanskrit as Kahtilla, Sophaghani, Sothaghni and Varshabhu, in assamese as Ranga, Punarnapha, in Bengali as Rakta ounerneva, in English as Horse purslena, Heg weed, in Guajarati as Dholisaturdi and Molssatodo, in Hindi as Gadapurna and Haipunarnava, in kannada as sanadika, kommeberu, and komma, in Kashmir as vanjula, punarnava, in Malayalam as chuvanna, tazhutawa, in Marathi as ghetuli, vasuchimui, satodimula, punarnava, and khapar khuti, in Orriya as lalapuiruni and Nalipurami, in Punjabi as khattan, in tamil as mukuratti (shihappu), in telugu as atikamamidi and erra gallijeru.

Boerhavia diffusa is known by various common names viz Erva tostao, Erva Toustao, Pega pinto, Hog weed, pig weed, atikamamidi Biskhapra, djambo, etiponia, fools lice, gandadar, ghetuli, katkatud, mahenshi, mamauri, ndandalide, oulouni niabo, paanbolibis, patal jarsh, pitasudu-pala, punar–nava, punerva, santh, santi, satadi thikedi, satod spreading Hog weed, Tellaaku, Thazl, thikri, touri-touri tshranas yoeghi, beshakapore and Raktpurnava.

1.1. Botany - Its various parts show distinct features as:

1) **Stem -** It is greenish purple, stiff, slender, cylindrical, swollen at nodes, minutely pubescent or nearly glabrous, prostrate divaricately branched. Branches from common stalk, often more than a meter long.

2) **Root -** Well developed fairly long somewhat tortuous, cylindrical, 0.2-1.5cm in diameter, yellowish brown to brown coloured. Its surface is soft touch but rough due to minute longitudinal striation and root scars, fracture, shoot, no distinct odour, taste is slightly bitter, sweet pungent.

3) **Leaves -** Leaves are simple, thick, fleshy and hairy, arranged in unequal pairs. Green and glabrous above and usually white underneath. The shape of the leaves varies considerably, ovate-oblong, round or subcordate at the base and smooth above. Margins of the leaves are smooth, waxy or undulate. The upper surface of the leaves is green, smooth and glabrous where as it is pinkish white and hairy beneath.

4) **Flowers -** Very small, pink coloured, nearly sessile or shortly stalked. 10-25cm in small umbels, arranged on slender long stalk. 4-10 corymbs, axillary and in terminal panicles. Bracteates, small, acute, perianth tube constricted above ovary, lower part greenish, ovoid, ribbed, upper part pink, and funnel shaped. 3mm long, tube 5 lobed but the white varieties are also known.

5) **Fruit -** The achene fruit is detachable, ovate, oblong, pubescent, five ribbed and glandular, anthocarp and viscid is one seeded nut, 6mm long clavate, rounded. The seed germinates before the onset of monsoon. The plant grows profusely in the rainy season and mature seeds are formed in October- November. Due to its sticky nature the plant gets stick on the clothes of humans and on the legs of animals, this helps in its dispersal from one place to another.

2.0. Study Objective

The objective of study was to understand utility and potential of the species with their propagation and other studies.

3.0. Literature Review

Various works have been carried out on different aspect of species. They are-

3.1. Chemical constituents - Many retinoid have been isolated from the roots of *Boerhavia diffusa* (Ahmed *et.al* 1990; Kadote *et. al* 1989; Lami *et.al* 1990 and Lami *et.al* 1991). Plant also includes a series of Boeravinones viz. Boeravinones A, B, C, D, E, F.; Punarnavoside phenolic glycoside etc. present in roots (Jain and khanna 1989, Indian Journal of chemical 1986). Besides these C-methyl flavones has been isolated from its roots (Indian Journal of Chemistry, 1984).

It contains 0.04 percent of alkaloids known as Punarnavine and Punarnavoside, an antifibrinolytic agent. It also contains about 6 percent of potassium nitrate an oily substance and ursolic acid. (Kokate *et.al*, 2005). The seeds of the plant contain fatty acids while root contain alkaloids (Aslam, 1996). The green stalk of the plant has been reported to contain Boerhavin and Boerhavic acid (Liogier, 1990).

3.2. Traditional Uses - *Boerhavia diffusa* L. exhibits diverse pharmacological properties, including antioxidant, anti-inflammatory, anticancer and antidiabetic activities largely due to its alkaloids, flavonoids and glycosides. Recent studies highlight enhanced bioavailability via green nanotechnology and confirm therapeutic potential in experimental models, supporting its traditional medicinal use and prospects for drug development (Kumar and Singh, 2025; Patel *et al.*, 2025; Rafi *et al.*, 2025). Each part of plants has a different therapeutic value and must be

prepared in its own way for maximum benefits. The roots, leaves, aerial parts or the whole plants have been employed for the treatment of various diseases in the Ayurvedic herbal medicine and it is used by millions of people in India, Nepal, and Srilanka and is being major influence on Unani, Chinese and Tibetan medicine.

All plant parts are used for medicinal purposes. Externally purnarnava is used to alleviate the pain and swelling. Fresh juice of its root is used in eyes into, mitigates the ailments of eyes like night blindness and conjunctivitis. The paste when applied on the wound, dries up the Oozing.

Internally Purnarnava is beneficial to treat a wide range of diseases. Its root is mainly used to treat diseases of all kinds such as dyspepsia, Edema, Jaundice, Menstrual disorders, anemia, liver, gall bladder and kidney disorder, enlargement of spleen, abdominal pain, abdominal tumors and cancer (kirtikar and Basu, 1956).

Punarnava is most commonly used and the best herb to alleviate swelling Since it cures corneal ulcers and night blindness (Gupta *et.al*, 1962) and help to restore vitality in men. People in tribal areas use it to hasten childbirth (shah et.al., 1983). The juice of *Boerhavia diffusa* leaves serves as a lotion in ophthalmic diseases. It is also administered orally as a blood purifier and to relieve muscular pain (CSIR 1988).

3.3. Pharmacological Properties

1. **Anti-diabetic activity -** In an experiment administration of aqueous solution of *B. diffusa* leaf extract (20mg/kg) for 4 weeks to normal and diabetic rats to study effect on blood glucose concentration and hepatic enzymes it was found that it significantly decrease the blood glucose and increase in plasma insulin level in both normal and diabetic rats (Pari and satheesh, 2004).

2. **Antioxidant property -** Leaves of *B. diffusa* shows stronger antioxidant activity than roots Ethanol and Methanol extract were screened for in vitro antioxidant activity. The activity was compared to standard antioxidant like ascorbic acid. Both extracts showed strong antioxidant activity in both the methods. Among two, ethanolic extract shows better antioxidant activity as compared to Methanolic extract in both the activities. (Rachh *et.al,* 2009).

3. **Analgesic and Anti-inflammatory activity -** Leaf juice of *B. diffusa* aqueous extracts shows analgesic property. It has traditional uses. Its mechanism shows analgesic effect but its mechanism remains unknown. Its aqueous extract shows morphinomimetic central analgesic properties.

4. **Antiviral activity -** It is reported to possess pharmacological, chemical and antimicrobial properties. It has potent antiviral efficacy against phytopathogenic viruses. Antiviral agent isolated from this plant when administered by foliar spraying in the field. This antiviral agent could protect some economically important crops against natural infection by plant viruses (Avasthi *et.al.*, 2006).

5. **Anti-stress and adaptogenic activity -** Its extract in proved the stress tolerance by significantly increasing the swim duration and reducing the elevated WBC, Blood glucose and plasma cortisol. Immunomodulation activity was evaluated by carbon clearance and delayed hypersensitivity test. The extract significantly increased carbon

clearance, indicating the stimulation of reticulo-endothelial system. It extracts also produce an increase in DTH response to SRBC in mice (Sumanthe *et. al*, 2007).

6. **Antibacterial activity -** Metabolic extract of *B. diffusa* leaves had significant In vitro antimicrobial activity. (Goyal *et. al*, 2010) It has shown antibacterial activity against *Staphylococcus aureus* bacteria which was found most susceptible. Maximum inhibition was observed in *Staphylococcus aureus* followed by *Bacillus megaterium* and *Bacillus cereus* at 50 micro liter concentrations (Girish, H.V., & Satish, S.,2008).

7. **Others -** It shows chemo preventive activity, anti-lympho-proliferative activity, Hepato-protective activity, Immuno-suppressive activity etc. (Goyal *et al.*, 2010).

3.4. Adulterants and Substitute

Boerhavia diffusa Linn (known as Raktapunarnava in Traditional system) are often adulterated with *Trianthema portulacastrum* Linn. Both plants are the source of two different Ayurvedic drugs Purnarnava and Varshabhu having similar therapeutic effects but differ in their stomata indices and Palisade ratios. *Trianthemaportula castrum* shows higher value.

4.0. Conclusion

The whole plant or its specific parts (leaves, stem and roots) are known to have medicinal properties and is used by indigenous and tribal people since long time. It is used as an Ayurvedic medicine in India and Unani medicine in Arab countries. Its uses were mentioned in Ayurveda, Charka-Samhita and Sushita Samhita. It has many ethanobotanical uses to cure asthma, urinary disorder, leucorrhea, rheumatism, encephalitis etc. (Banjare *et.al* 2012).

5.0. Future Recommendations

a) To promote ethanobotanical studies to document traditional knowledge and uses.

b) To implement conservation strategies to protect natural populations from overexploitation.

c) To assess toxicity and safety profiles for future therapeutic or nutraceutical development.

d) To investigate isolation and characterization of novel bioactive flavonoids and polyphenols.

e) To develop nutraceutical and functional food products leveraging its antioxidant potential.

Declarations

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Consent for publication

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Availability of data and material

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